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PHYTOGEOGRAPHY AND ITS RELATION TO TAXONOMY AND OTHER BRANCHES OF SCIENCE

By P. A. RYDBERG

Phytogeography in this country is almost a neglected field. Until recently no attempt had been made to give an adequate account of the phytogeography of North America or any larger part thereof. The phytogeographical sketches extant are scattered through the botanical journals and a few books on systematic botany. No attempt had been made to bring these records together until Professor Harshberger's *Phytogeographic Survey of North America** appeared last year. The writer admires Professor Harshberger's courage in undertaking such a stupendous work, when in reality so little was known of the phytogeography of this continent, and still less was published. In a voluminous work, as the one there presented, compilation is not only allowable, but legitimate and altogether necessary, for it is impossible for any one person to know the flora of the whole of North America. But how is it possible to compile, in cases where there is but little or nothing to compile from.

The writer has many times been thinking of writing a phytogeographical sketch of the Rocky Mountain region, in which he has spent six summers, besides one in the Black Hills of South Dakota and two in the foot-hill region of western Nebraska. One reason for not having done so has been the lack of time. Another reason has been that he knew that the sketch had to be written practically from his personal knowledge of the region, for very few of the records are of any great help, without con-

* *Die Vegetations der Erde*, vol. XIII.

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siderable sifting and digesting. The third reason has been that he has not felt himself a good enough phytogeographer to undertake it. Furthermore, the sketches that are extant, dealing with the flora of the Rocky Mountains, are not written by phytogeographers. Brandegee, Porter, Parry, Watson, Greene, A. Nelson, M. E. Jones, and myself were, or are, mainly taxonomists, Fremont an explorer, Tweedy a surveyor and botanical collector, Merriam a zoölogist, Leiberg, Ensign and Sudworth forestry men, Cockerell an entomologist and general scientist, Clements and Ramaley ecologists, etc. It was, therefore, by no means an easy task to give a phytogeographical sketch of the Rocky Mountain region. In the writer's opinion, Professor Harshberger has not succeeded very well in this respect, not even as well as might be expected. How he has succeeded in sketching the vegetation of other parts of our country, I can not tell, as I have too little knowledge thereof to venture to express any opinion. The main reason why he did not succeed so well, was because he had very little personal knowledge of the Rockies, but I think that it depended also upon the fact that our phytogeographers, and ecologists also, do not in general realize the importance of the relationship between phytogeography on one side and taxonomy and other branches of science on the other.

It is not necessary that a good phytogeographer should be a good phytographer—he need not have described a single species of plant; neither that he should be a good systematist—he need not have studied the systematic relationship of a single group of plants; but it is important that he should be a fairly good general taxonomist, so as to know the plants he is dealing with. When a person is, by circumstances, practically confined to compilation, it is still more important that he should know the species credited to a certain region, in order to be able to sift judiciously the records. In the list of trees and shrubs of the Black Hills are enumerated by Harshberger: *Chimaphila umbellata*, *Cornus canadensis* and *Linnaea borealis* (should have been *L. americana*). Either by ignorance or by carelessness these have been included among trees and shrubs. *Cornus canadensis* is less shrubby than our strawberries, for the rhizome, the only

woody portion, is not so stout as that of the strawberry. Among the trees of the Rocky Mountains are enumerated *Pyrus sambucifolia*, an Asiatic species, *Cupressus guadalupensis*, a tree of Lower California, *Sapindus marginatus*, one from Florida, and *Prunus angustifolia*, the Chickasaw Plum, a tree of unknown origin, naturalized in eastern United States. On page 254, in the list of plants common to the Sierra Nevada, the Cascade Mountains, and the Rocky Mountains, are given among others: *Antennaria dioica* and *Arabis hirsuta*, two European plants. The only plant of the *A. dioica* group common to those regions is *A. rosea*, and the American representative of *Arabis hirsuta* is *A. ovata* Poir. Further are enumerated *Arnica Chamissonis*, a strictly boreal plant, and *Spraguea umbellata*, a plant confined to the Sierras and neighboring mountains, and represented in the Rockies by *S. multiceps* Howell. On page 249, *Spiraea betulifolia* is given as transcontinental. The species is Siberian. The only close relative it has on this continent is *S. Steveni*, an Alaskan species. *S. splendens* (= *S. arbuscula*) of California and Oregon, *S. lucida* and *S. densiflora* of the Rockies and *S. corymbosa* of the Alleghenian region, all of which have been confused with *S. betulifolia*, have erect instead of reflexed sepals. Among the alpine plants of the Rockies are enumerated on page 192 *Smelowskia calycina*, a Siberian plant, on page 193 *Sausurea alpina* and on page 194 *Androsace Chamaejasme*, both European plants. These are represented in the Rocky Mountains by *Smelowskia americana* and *S. ovalis*, *Sausurea densa* and *S. remotifolia*, and *Androsace carinata*. On page 248 are enumerated among the immigrants from the northwest (Italics mine): *Alnus incana*, *Kalmia glauca*, and *Vaccinium Myrtillus*, all north-eastern plants, represented in the Rockies by *Alnus tenuifolia*, *Kalmia microphylla*, and *Vaccinium oreophilum* and *V. scoparium*.

A good phytogeographer should not have made errors like these. It is not necessary that he should be a taxonomist of the "finely splitting kind," so that he, of his own accord, should see all those fine distinctions drawn by systematists nowadays, but he should keep up with the progress of taxonomy enough, so that he would not use determinations made by Tom, Dick, and

Harry, a half or a quarter of a century ago. It was very proper that Tweedy in 1885 and in 1886, should report, among the vegetation of the Geyser areas of the Yellowstone Park, such plants as *Chrysopsis villosa* (now known to belong to the plains of Kansas and Nebraska), *Gnaphalium Sprengelii* (a South American plant), *Panicum dichotomum* var. *pubescens*, *Castilleja minor*, *Hulsea nana* and *Botrychium ternatum* var. *australe*, for at that time the plants were known, although erroneously so, under those very names: but it is not proper now, after all the work done on the flora of the region by Tweedy, Aven Nelson, Elias Nelson, Dr. Mearns, Rose, Burglehouse, Ernst Bessey and myself, and others. A little attention paid to my Flora of Montana and the Yellowstone National Park and other more recent publications would have shown to anyone that these names meant *Chrysopsis depressa*, *Gnaphalium sulphurescens* or *G. lagopodioides*, *Panicum thermale*, *Spraguea multiceps*, *Castilleja exilis*, *Hulsea carnosae*, and *Botrychium Coulteri*. We are not surprised to see Parry in 1863 having reported for Colorado, *Papaver nudicaulis*, *Gentiana frigida* and *Pedicularis sudetica*, instead of *Papaver radiculatum*, *Gentiana Romanzovii* and *Pedicularis scopulorum*. It is a little more surprising to see it done to-day (see page 565). The writer himself was perhaps excusable for enumerating among the plants of the Black Hills, in 1894 (the year when the manuscript was prepared, printed in 1896), such plants as *Neillia* (now *Opulaster*) *opulifolia* (an eastern species), *Synthyris rubra* (a northwestern plant), *Stachys aspera* (eastern), *Osmorrhiza nuda* (Californian), and *Mertensia sibirica* (Asiatic); but he would not be if he did it to-day.

A good phytogeographer should be fairly well acquainted with the nomenclature of the time. It matters little which school he follows. It would not do to simply accept and copy any name given in a certain report, without judicious sifting. If care is not taken, it may happen, as it has in Professor Harshberger's book, that the same plant may be under different names, even on the same page. On pages 192-4, we find for instance both *Alsine* (*Arenaria*) *verna* and *Arenaria* (*Alsinopsis*) *propinqua*, which, as far as the Rockies are concerned, represent the same

plant; so also *Geum Rossii* and *Sieversia turbinata*, *Gentiana frigida* and *G. Romanzovii*. On page 532, we find both *Argemone alba* and *A. platyceras*. They both stand for *A. intermedia*, the only species found in Nebraska. *A. alba* is found in Florida and *A. platyceras* is mainly Mexican.

That the same plant appears under different names on different pages is a rather common occurrence in Harshberger's book. Only a few instances may be mentioned, as *Alnus incana*, on page 248, and *A. tenuifolia*, on 250; *Agropyron divergens*, on 561, and *A. spicatum*, on 516, 536, etc.; *Aristida purpurea*, on 527, 528, 530, and 532, and *A. longiseta*, on 537 and 582; *Betula occidentalis*, on 566, *B. microphylla*, on 570, and (*B. fontinalis*) in the index; *Cercocarpus betuloides*, on 266, *C. betulifolius*, on 269 (= *C. parvifolius* Nutt.) in the index, all representing *C. montanus* Raf. It is not quite as bad when he uses different generic names on different pages, as for instance *Neillia opulifolia*, on page 566, and *Physocarpus opulifolius*, on 249; *Carduus Pitcheri*, on 399, and *Cnicus* (*Cirsium*) *Pitcheri*, on 499. *Echinacea angustifolia*, on page 522, and *E. purpurea*, on 524, do not indicate in any way that they are congeneric with *Brauneria pallida*, on 518 and 527. A little hunting in the index would probably bring to light dozens of similar cases.

A good phytogeographer should be careful about using synonymy. Harshberger's book shows more than one case of bad synonymy. Only one such case of Rocky Mountain plants may be cited. On page 192 we find *Arenaria* (*Alsinopsis*) *Rossii* R. Br. (*A. stricta* Michx.). The synonym belongs to *A. Michauxii*, as is correctly given in the index. There are also some names in the book which as far as I know have never been published, as for instance *Lewisia brachycarpa* Engelm., on page 195, and *Sieversia grandiflora*, on 562. The former is probably a typographical error for *L. brachycalyx*, although Engelmann never had it in the genus *Lewisia*, but in *Calandrinia*. What *Sieversia grandiflora* stands for, I am at a loss to know.

A good phytogeographer must be a fairly good geographer. It is not so important that he should be well versed in political or commercial geography, but he must know the physiography

of the region he is treating. He must not let the political boundaries mislead him to draw corresponding division lines between his phytogeographical provinces or districts. As far as the Rocky Mountains are concerned, Professor Harshberger has committed two serious errors in this way: (1) He has drawn the line between the northern Rockies and the southern Rockies to correspond to the international boundary between Canada and the United States. (2) He has, at least in one part of his book, included the whole of New Mexico and Arizona in the Rocky Mountain Region.

On page 546, Professor Harshberger divides the Rocky Mountain Region into two districts: the Northern or Dominion District and the Southern or Park Mountain District, together with an eastern outlobe, the Black Hills Territory. Anyone who is well acquainted with the flora of the Rockies knows that nearly all the plants characteristic of the Canadian Rockies are also found in western Montana and northern Idaho. All the forest trees of the Canadian Rockies, the Gold Range and the Selkirks are also found, as far as I know, in the Bitter Root Mountains or in the Flathead and the Coeur d'Alene valleys. In fact, the northern Rocky Mountains, from a botanical standpoint, extend south to northern Wyoming, although many plants characteristic of the Selkirks and the Bitter Root Mountains are lacking. The Wind River Mountains may be regarded as the most southerly extension thereof. The southern Rockies, which may properly be called the Park Mountain District, do not extend farther north than to the Laramie Mountains of southern Wyoming. Between these and the Wind River Mountains is an opening, where the plains practically break through. Several of the forest trees of the southern Rockies are not found north of this break, as for instance, *Picea pungens*, *Abies concolor*, *Pinus aristata* and *P. edulis*, *Sabina monosperma* and rarely *S. utahensis*, nor any of the scrub-oaks. Of course *Larix occidentalis*, *L. Lyallii*, *Abies grandis*, *Tsuga heterophylla*, *T. Mertensiana*, *Picea albertiana*, *Pinus monticola*, *Thuja plicata*, *Sabina prostrata*, and *Taxus brevifolia* of the Canadian Rockies are not found in Colorado, but are found in western Montana and northern Idaho, and some of them extend into northern Wyoming.

In treating the coniferous forests formations of the southern or Park Mountain Region, Professor Harshberger mentions the following belts: (1) *Pinus ponderosa* belt, (2) *Pinus monticola* belt, (3) *Abies subalpina* belt. These three "belts" were evidently taken from Leiberg's Survey of the Coeur d'Alene Mountains. As stated before, this region belongs to the northern Rockies and fits poorly with the Park Region of Colorado. The low-land *Pinus ponderosa*, which gave the name to the first belt, is not found in Colorado. It is there represented by the up-land *Pinus scopulorum*, often regarded as a variety of *P. ponderosa*. *Pinus monticola* is lacking altogether. Regarding the *Abies subalpina* belt it may be remarked that Harshberger makes the following statement: "The *Abies subalpina* belt exists above 5,000 feet." This is true as far as the Coeur d'Alene region is concerned, but does it give a correct impression, when the Park Mountains of Colorado are considered? I doubt if it occurs here below 9,000 feet, and it does not form a belt, but grows scattered. In Colorado, *Picea Engelmannii*, not *Abies subalpina*, is the characteristic tree of the Subalpine zone. The three belts given above characterize better the Selkirks of the Dominion District than the Park Mountain District of southern Wyoming, Colorado, and northern New Mexico. Harshberger gives practically nothing definite concerning the zonal distribution of the trees of the latter district. The zones here are four and rather distinct. (1) The foot-hills or transition zone between the plains and the mountains proper. This could well be called the juniper or cedar belt. North of the Arkansas Divide, the characteristic woody plant is *Juniperus* or *Sabina scopulorum*, mixed with *Pinus scopulorum*, *Cercocarpus montanus*, *Rhus trilobata* and its relatives, etc. South of the Arkansas Divide the characteristic trees are *Juniperus* or *Sabina monosperma* and *Pinus edulis*. Above these is usually a belt of chaparral consisting of scrub-oaks, service berries and skunk-brush. (2) The montane zone or pine belt, with *Pinus scopulorum*, *P. Murrayana*, *P. flexilis*, *Pseudotsuga mucronata*, *Abies concolor*, *Picea pungens*, etc., rather mixed. (3) The subalpine zone or spruce-aspen belt. On the northern cooler slopes *Picea Engelmannii* is predominant, but

mixed with *P. pungens*, *Pseudotsuga*, and *Abies lasiocarpa* (*A. subalpina*). On richer soil, there are almost pure stands of aspen; *Populus tremuloides*. On southern drier exposed ridges near the timber line *Pinus aristata* is at home. (4) Alpine zone, above the timber line, with the woody vegetation represented by low shrubs only.

As stated above, Professor Harshberger has in one place included Arizona and New Mexico in the Rocky Mountain Region. I refer to pages 244-245, where he enumerates the trees of the Rockies. In this list which enumerates 63 species are included practically all the trees found in those two states.* In the list we find the following: *Juniperus californica*, *J. virginiana*, *J. pachyphloea*, *Cupressus guadalupensis*, *Pinus chihuahuana*, *P. arizonica*, *Populus monolifera* (*P. deltoides*), *Morus microphylla* (*M. rubra*), *Juglans californica*, *J. rupestris*, *Condalia obovata*, *Olivea tesota*, *Parkinsonia Torreyana*, *Prosopis pubescens*, *P. juliflora*, *Acacia Greggii*, *Platanus Wrightii*, *Chilopsis saligna* (should have been *C. linearis*), *Arbutus Menziesii*, *Cereus giganteus*, *Sapindus marginatus*, *Prunus angustifolia*, *Pyrus sambucifolia*. Of these *Juglans californica*, *Juniperus californica* and *Arbutus Menziesii* are Pacific Coast species; *Cupressus guadalupensis*, *Sapindus marginatus*, *Prunus angustifolia* and *Pyrus* [now *Sorbus*] *sambucifolia*, I have discussed before. For *Populus monolifera* and *Juniperus virginiana*, eastern trees, should be substituted *P. Sargentii* and *J. scopulorum*. All the rest enumerated above belong either to the desert regions of Arizona and New Mexico or else to what Harshberger, on his map, has marked Western Sierra Madre. Rightly he extends this Mexi-

* Some time after writing this article, I happened to read Gray and Hooker's article on the Vegetation of the Rocky Mountains, and found that Harshberger's list is practically taken from that paper, he having omitted two species, added seven, and rearranged the order. Gray and Hooker acknowledged that they had compiled the list from Sargent's report in the 10th United States Census. Much of what is here said of Harshberger's list, applies as well to that of Gray and Hooker, and shows what errors even the best botanists may commit in compiling without sifting. The only differences between their standpoint and that of Harshberger is that in their article they treated of the whole continental divide, and Harshberger had already limited the Rocky Mountain Region before giving the list, and that their article was published over 30 years ago.

can region into Arizona. Professor Harshberger introduces his list with the following remarks (see page 244): "The mere botanical enumeration of the following species of trees gives no proper idea of the arboreal flora of the region." Certainly, as the list is made up, it does not. *Abies grandis*, common in the northwest, *Sabina monosperma*, in the south, *Populus acuminata*, *P. Wilslezeni*, *Alnus tenuifolia*, *Acer glabrum*, the two species of *Tsuga*, several of *Salix* and *Betula*, etc., are omitted. Further down, he remarks: "From the whole region oaks are conspicuously absent as trees." *Quercus macrocarpa* (found, however, only in the Black Hills) and *Q. leptophylla* are always trees; *Q. utahensis*, *Q. Gambellii*, *Q. neomexicana* and *Q. subtomentosa* are sometimes trees 20 to 30 feet high.

A good phytogeographer should carefully consider the geographical distribution of the different species; (1) not cite them from a region where they do not grow; (2) carefully consider to which regions or zone they really belong and to what extent they have invaded other districts; (3) whether they are the characteristic or primary species of a certain zone or are only incidentally found there. Many data can be had from printed reports, but as noted above many of the reports are very unreliable and most of them need verification. A good deal of personal field work is imperative, but if such is impossible or unfeasible, the same result can practically be gained by studying the collections in our greater herbaria. If Professor Harshberger had studied a little more the herbaria at the University of Pennsylvania and the Philadelphia Academy of Sciences, which are easily accessible to him, I think that many misrepresentations of the geography of individual plants could have been avoided. I shall mention only a few from the Rocky Mountain Region. On pages 246-7 is given a list of 26 *woody plants* from *California* [Italics are mine], which enter the northwest of the Rockies and extend "only as far as the Bitterroot Mountains in Idaho." In this list are included *Pinus albicaulis*, which is not really a *Californian* tree and is found in Montana east as well as west of the divide and also on the Yellowstone Plateau; *Artemisia discolor* var. *incompta* and *A. ludoviciana*, which are by no means woody and the latter

of the two originally described from Kansas and not found in California; *Rhamnus Purshiana*, which extends into southern Utah; *Rubus leucodermis*, extending to the northern part of the same state; and *Spiraea arbuscula*, wholly Californian and Oregonian. Among the "northeastern and eastern element" entering the region "southward to Idaho and Montana" are erroneously enumerated the following: *Abies balsamea*, *Picea alba* [*P. canadensis*], and *P. Mariana* are not found in the Rockies, reaching the foothills of the same only in the upper valleys of Piece and Liard rivers in Alberta. The specimens of *P. alba* or *canadensis* reported from southern Alberta, British Columbia and Montana, and seen by the writer, all belong to *P. albertiana* S. Brown. *Ulmus americana* and *Quercus macrocarpa* have been found in the region only in the Black Hills; and *Bryanthus* [*Phyllodoce*] *empetriformis* is a western not an eastern species.

On page 248 it is stated that the Southern Rocky Mountain Region is clearly distinct from the Northern Region "by the injection of floral elements derived from Mexico and the Great Basin." A list of 16 species follows. Of these *Acer glabrum* is endemic to the Rockies. *Berberis repens*, *Juniperus scopulorum*, *Clematis ligusticifolia* and *Lonicera ciliosa* are just as common in the northern as in the southern Rockies. *Artemisia dracunculoides* is eastern, but found in both. *Rosa nutkana* and *Gaultheria myrsinites* are northern, the former not found at all and the latter rarely in the southern Rockies. None of them belong to Mexico and only a few of them are found in the Basin. *Tetradymia glabrata*, enumerated among those that have entered from the northwest, belongs to the Great Basin. On page 249 is given a list of a small element "confined to the Central Mountains." In this list is included *Fraxinus anomala*, a canyon plant, not found in the mountains proper and barely reaching the region from the southwest. In the list of plants ranging from Colorado northward is enumerated *Ceanotus ovatus*, a species of the plains and prairies, extending into the region only in Colorado and the Black Hills, and *Salix irrorata*, confined to the Southern Rockies.

In the list of Great Basin plants, on page 250, are enumerated *Ceanotus velutinus* and *Physocarpus Torreyi*, both typical Rocky

Mountain Plants, which however are found also in the Basin Mountains. Among the trees and shrubs which had their "origin in Mexico" we find *Artemisia tridentata*, *Purshia tridentata* and *Cercocarpus ledifolius*, all Basin plants and not found in Mexico, except the first; and *Tetradymia canescens* which belongs to the Columbia plains. In the list of plants common to Sierra Nevada and the Cascade Mountains, on page 254, we find *Lonicera involucrata*, a plant common in the Rockies and extending northeast to the Hudson Bay. On page 249, it is given as transcontinental. *Luzula spicata* and *Potentilla procumbens* are said to be common to the Sierras and the Rockies "only." They are both circumpolar arctic-alpine plants.

A good illustration of carelessness in referring plants to a wrong life zone, is given on pages 192-194, where Professor Harshberger lists the alpine plants. That a plant occasionally grows at a certain high altitude, or that it is found incidentally above what seems to be the timber line, does not make it an alpine plant. In the list are found the following, which usually grow on treeless hills or ridges, but still can not be called alpine: *Arabis canescens*, *Vesicaria* [Lesquerella] *alpina*, *Homalobus tenuifolius*, *Balsamorhiza incana*, *B. Hookeri*, *Tanacetum capitataum*, *T. Nuttallii*, *Tetradymia inermis*, and *Pentstemon secundiflorus*. The following grow on dry plains and foothills: *Solidago nana*, *Stenotus acaulis*, and *Pentstemon humilis*. The following wood-plants are included: *Mitella pentandra*, *M. trifida*, *Lonicera coerulea*, *Linnaea borealis* (should have been *L. americana*), and *Arnica fulgens*. *Erigeron Coulteri* and *Senecio triangularis* grow on subalpine creek banks, *Lithophragma tenella* on wet hillsides, *Arnica longifolia* and *Dodecatheon pauciflorum* in wet meadows far below the alpine zone; so also *Primula mistassinica*, which is not found in the Rockies at all, but belongs to the Hudson Bay region and the northeast. These plants, erroneously given as alpine, constitute one sixth of the list.

A good phytogeographer should differentiate between different formations due to moisture, to exposure to sun, rain, and wind, to altitude, to improper drainage, but these factors are almost wholly neglected in the treatment of the Rocky Moun-

tains. I have already pointed out the different belts or zones due to altitude in the southern Rockies, not alluded to by Harshberger. The grass lands of the Rockies he dismisses with half a page, on 561, and does not differentiate the various grass-covered areas, as for instance the lowland meadows with their practically eastern grass-flora, the table-lands with a flora similar to that of the Great Plains, the bench lands and alkali flats with their predominantly endemic species, the dry grass covered ridges, the grassy mountain slopes, covered mostly by species of *Festuca*, the mountain tops and alpine meadows, all with their characteristic grass flora. Such things are simply omitted.

A good phytogeographer should also be somewhat of a geologist. As the writer makes no claim of being such, he has omitted discussion of Professor Harshberger's geological treatment.

A good phytogeographer should also be a fair bibliographer and historian. The publications on the Rocky Mountain botany by M. E. Jones, Miss Eastwood, Blankinship and G. E. Osterhout seem to have escaped Harshberger's notice. Jones, especially, has published a good deal of taxonomic work with phytogeographical notes, and also a short but good phytogeographic sketch well worth reading.

Professor Harshberger's part on floristic work is divided in several sections, of which the fifth treats of the Prairies, Arid Plains, and Rocky Mountains. Although the first part of this section does not treat of the Rocky Mountains, I was induced to read the same. As none of the reviewers of the book has called the attention to an incongruity in this part, I may do so here. It is surprising to find that the list of botanical explorers of the Prairies and Great Plains is headed by John and William Bartram, Peter Kalm, Michaux, father and son, and Pursh. None of these early explorers, except Michaux the younger, were west of the Alleghanian Region and the eastern part of the Region of the Great Lakes. Michaux the younger, went west as far as Ohio and Tennessee, perhaps to the Mississippi River. On the map at the end of the volume, the Prairie and Great Plain Region extends from Illinois to the Rockies, and Harshberger himself in the text, on page 519, limits the eastern boundary to central

Illinois. Of course, there are isolated small prairies east thereof, perhaps as far east as western New York, but I think that all these early botanists should be excluded from the list of the explorers of the Prairie Region. They belong to the Northeast.

Of course there are many good features in Professor Harshberger's Phytogeographic Survey, as for instance his bibliographies, which will be very useful to students of phytogeography; but these good features I have omitted, for they do not bear upon my subject. This article is not intended to be, as it may seem, merely an adverse criticism of Professor Harshberger's work under a disguised title. There is something more aimed at. Not long ago, all botanical work done in this country was taxonomic work, usually known as systematic botany, although much had indeed little of "systematic" in it. Now it is different. Courses in taxonomy are almost excluded from the curriculum of many of our colleges and universities, or if not excluded, so little esteemed that students are discouraged from entering upon them. The taxonomist, whether a systematic botanist in the true sense or a phytographer, is looked upon by phytogeographers, ecologists, physiologists, cytologists, and morphologists as of a lower grade of stuff;—as if it took a less fine grain of brain to make a first class systematist than any other kind of -ist. What I have aimed to show is that the taxonomist has his place in Botany, and if his work is ignored, other -ists, who are dependent upon him, can not do good work. Professor Harshberger's Phytogeographical Survey, in a field fairly well known to me, gave me an opportunity to show to what such ignoring would lead.

NEW YORK BOTANICAL GARDEN.

PISTILLODY IN ARGEMONE PLATYCERAS LINK AND OTTO.

BY I. M. LEWIS

The occurrence of pistillody or the conversion of stamens into pistils is by no means common, neither is it rare. It has been reported in many genera of plants and has been repeatedly